

CLAIMS

1. A method for removing perfluoroethane (C_2F_6) from a gas mixture comprising perfluoroethane and one or more other fluorocarbon compounds, which method comprises contacting the gas mixture with an adsorbent comprising zeolite of the
5 mordenite structure wherein at least a portion of the C_2F_6 is selectively adsorbed by the adsorbent, and withdrawing a C_2F_6 -depleted gas product from contact with the adsorbent.
2. The method of Claim 1 wherein the zeolite adsorbent has a silicon to aluminum (Si/Al)
10 atomic ratio of less than about 50.
3. The method of Claim 1 wherein the zeolite adsorbent is decationized such that at least about 50% of the cations are replaced with protons.
- 15 4. The method of Claim 1 wherein one of the one or more other fluorocarbon compounds in the gas mixture is perfluoromethane (CF_4).
5. The method of Claim 4 wherein the C_2F_6 -depleted gas product comprises CF_4 .
- 20 6. The method of Claim 5 wherein the C_2F_6 -depleted gas product comprises at least 99.99 vol% CF_4 .

7. The method of Claim 1 comprising a pressure swing adsorption process using at least the steps of

5 (a) introducing the gas mixture at a feed pressure into an adsorber vessel containing the zeolite adsorbent of the mordenite structure having a silicon to aluminum (Si/Al) atomic ratio of less than about 50, selectively adsorbing at least a portion of the C_2F_6 on the adsorbent, and withdrawing the C_2F_6 -depleted gas product from the adsorber vessel;

10 (b) terminating flow of the gas mixture into the adsorber vessel and reducing the pressure in the adsorber vessel by withdrawing a C_2F_6 -enriched waste gas therefrom, thereby desorbing C_2F_6 and regenerating the adsorbent;

(c) pressurizing the adsorber vessel; and

(d) repeating steps (a) through (c) in a cyclic manner.

15 8. The method of Claim 7 wherein the pressure swing adsorption process is carried out using two or more adsorber vessels operating out of phase such that one adsorber vessel undergoes steps (b) and (c) while another vessel undergoes step (a).

20 9. The method of Claim 7 wherein the pressure swing adsorption process is carried out using two or more adsorber vessels operating out of phase such that at least a portion of the C_2F_6 -enriched waste gas withdrawn from one adsorber vessel undergoing step (b) is introduced into another adsorber vessel undergoing step (c).

25 10. The method of Claim 6 wherein one of the one or more other components in the gas mixture is perfluoromethane (CF_4) and wherein the method further comprises purging the adsorber vessel with an inert gas during step (b) to provide a purge gas effluent comprising the inert gas, C_2F_6 , and CF_4 , passing the purge gas effluent through secondary adsorber vessel in which C_2F_6 is selectively adsorbed, withdrawing a secondary purge stream comprising purge gas and CF_4 from the secondary adsorber,

cooling and partially condensing purge stream to provide a cooled purge stream, and recovering condensed CF_4 from the cooled purge stream.

11. The method of Claim 1 comprising a temperature swing adsorption process using at least the steps of

(a) introducing the gas mixture at a feed temperature into an adsorber vessel containing the zeolite adsorbent of the mordenite structure having a silicon to aluminum (Si/Al) atomic ratio of less than about 50, selectively adsorbing at least a portion of the C_2F_6 on the adsorbent, and withdrawing the C_2F_6 -depleted gas product from the adsorber vessel;

(b) terminating flow of the gas mixture into the adsorber vessel, purging the vessel with a purge gas at a temperature greater than the feed temperature, and withdrawing from the vessel a purge gas effluent comprising the inert gas and C_2F_6 , thereby desorbing C_2F_6 and regenerating the adsorbent;

(c) cooling the adsorber vessel; and

(d) repeating steps (a) through (c) in a cyclic manner.

12. The method of Claim 11 wherein the temperature swing adsorption process is carried out using two or more adsorber vessels operating out of phase such that one adsorber vessel undergoes steps (b) and (c) while another vessel undergoes step (a).

13. The method of Claim 11 wherein at least a portion of step (b) is carried out in a temperature range of 50°C to 300°C .

14. The method of Claim 11 wherein the purge gas is selected from the group consisting of nitrogen, argon, helium, hydrogen, and mixtures thereof.

15. The method of Claim 11 wherein one of the one or more other components in the gas mixture is perfluoromethane (CF_4) and wherein the method further comprises cooling the purge gas effluent to provide a cooled purge gas effluent containing the inert gas, C_2F_6 , and CF_4 , passing the cooled purge gas effluent through secondary adsorber vessel in which C_2F_6 is selectively adsorbed, withdrawing a secondary purge stream comprising purge gas and CF_4 from the secondary adsorber, cooling and partially condensing purge stream to provide a cooled purge stream, and recovering condensed CF_4 from the cooled purge stream.

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16. A high purity perfluoromethane (CF_4) product obtained by the steps comprising

(a) providing a gas mixture comprising CF_4 and at least perfluoroethane (C_2F_6);

(b) contacting the gas mixture with a zeolite adsorbent of the mordenite structure having a silicon to aluminum (Si/Al) atomic ratio of less than about 50 wherein at least a portion of the C_2F_6 is selectively adsorbed by the adsorbent to provide gas enriched in CF_4 ; and

(c) withdrawing the gas enriched in CF_4 from contact with the adsorbent to provide the high purity CF_4 product.

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17. The product of Claim 16 wherein the zeolite adsorbent is decationized such that at least about 50% of the cations are replaced with protons.

18. The product of Claim 16 wherein the high purity CF_4 product comprises at least 99.99 vol% CF_4 .

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